APPENDIX P: Summary of Available Persistence Data for Aldicarb and its Sulfoxide and Sulfone Degradates

Fate Endpoint *	**Aldicarb**	**Aldicarb sulfoxide**	**Aldicarb sulfone**
Hydrolysis – pH 5	stable (MRID 00102065)		495 da (MRID 45592104**)
Hydrolysis – pH 7	stable (MRID 00102065)	6% loss at 30 da (MRID 00102066)	63 da (MRID 45592104**)
Hydrolysis – pH 9	<10% loss at 30 da (MRID 00102065)	2.3 da (MRID 00102066)	1 da @ 25^{o}C; 32 da @ 5^{o}C (MRID 45592104**)
Hydrolysis in published literature: Lemley & Zhong, 1983 (45602901**); Hansen & Spiegel, 1983 (45602902**); Lemley & Zhong, 1984 (45602903**)	Hydrolysis is sensitive to hydroxide concentration (base-catalyzed), with sulfone most sensitive and aldicarb least (Lemley & Zhong, 1983). Aldicarb hydrolysis rates increase at pH levels >7.5; sulfoxide and sulfone hydrolyze more readily and are affected by pH and temperature (results for 5, 15 ^{o}C) (Hansen & Spiegel, 1983). Both pH and temperature dependence seen in hydrolysis of all 3 chemicals. Rates for sulfone at 25 ^{o}C 60 da @ pH7, 6 da @ pH8 (Lemley & Zhong, 1984)		
Aqueous photolysis (MRID 45592105**)	4 da		123 da (12 hr lite/dark)

Aerobic soil metabolism (MRID 44005001)	2.3 da in pH 6.1 sl soil (unnamed from NJ)	Concentrations fluctuated between 9-86% of applied from 7-60 da post treatment	Concentrations fluctuated between 3-80% of applied from 7-60 da post treatment	NOTE: 2000 DER indicates that sulfoxide, sulfone data were too variable to calculate formation, decline rates
Aerobic soil metabolism range (MRID 00101934)	7 – 26 da in 2 soils x 3 pH x 2 moisture contents; avg 13.5 da; 90%upper conf bound 16 da	Total carbamate residues (parent, sulfoxide, sulfone)	11 – 110 da in 2 soils x 3 pH x 2 moisture contents; avg 34 da; 90%upper conf bound 48 da	See Ald_ASM_sum, mrid00101934 Worksheets
Aerobic sol metabolism, sulfone (MRID 00053370)			3.33 da half-life (pH 6.7 soil)	See Ald_ASM_sum, 00053370 Worksheets
Aerobic soil metabolism (MRIDs 00093642,00080820, 00093640, 00053366)	11, 12, 17 days for 3 soils	Total carbamate residues (parent, sulfoxide, sulfone)	28, 47, 136 for 3 soils	See Ald_ASM_sum, 00093642 Worksheets
Lab studies of all 3 forms (Lightfoot et al, 1987; Bank & Tyrrell, 1984)	Combined residues (aldicarb, sulfoxide, sulfone) degraded to oximes, nitrilse with half-lives up to 3 months; soil-catalyzed hydrolysis, not aerobic metabolism was driving factor Lightfoot et al, 1987 (MRID 45602904**) has been submitted, reviewed by contractor. It looks at degradation of aldicarb and total carbamates (parent, sulfoxide & sulfone) in surface soil, soil water, distilled water, sat'd zone soil in sterilized/unsterilized conditions (see below)			Qualitative value only

Lightfoot et al, 1987 (MRID 45602904**)	1 (unsterilized) – 2.5 (sterilized) da surface 37 (unsterilized) – 15 (sterilized) da subsurf	Combined (parent+degr): 44 (unsterilized) – 10 (sterilized) da surface soil 123 (unsterilized) – 16 (sterilized) da subsurface soil		See 45602904 Worksheet
Aerobic soil metabolism, sulfoxide		5 da (MRID 45592108)		
Aerobic soil metabolism, 2002 registrant submissions; DERs completed	5.8 da in IL sil soil (pH 5.7); 9.6 da in NC ls (pH 6.4). Recalc t1/2 using all data (MRID 45739801)		15.2 da in IL sil (pH 7.9); 91.2 da in NC ls (pH 6.2). Recalc t1/2 using all data (MRID 45739802)	See 45739801, 45739802 worksheets
Aerobic soil metabolism literature		sulfone & sulfoxide half-lives in Dutch subsoils from 2-131 da under anaerobic cond., 84-1100 da under aerobic cond. (Smelt et al, 1983)		Subsoil rates; qualitative value only.
Aerobic aquatic metabolism (literature)	70-173 da in aerobic Dutch surface waters (Vink et al, 1997)			Qualitative value only
Aerobic aquatic metabolism, 2002-3 registrant submissions **	3.8 da (ttl system) in pH 7.2 water / pH 6.3 sediment (MRID 45592107**)	5 da (ttl system) in pH 7.0 water / pH 6.3 sediment (MRID 45592108**)	3.5 da (ttl system) in pH 7.0 water / pH 6.3 sediment (MRID 45592109**)	See aqmet44592107 (aldicarb), aqmet44592108 (sulfone), aqmet44592109 (sulfoxide)

Anaerobic aquatic metabolism	3 hr with no discernable pattern of formation/decline of sulfone, sulfoxide (MRID 43805701)	3.4 da (MRID 45592110)	3.5 da (MRID 45592111)
Published field studies (Jones & Estes, 1995)	Summarized results of 32 field studies for aldicarb in 24 locations. Half life of total carbamate residues (aldicarb, sulfoxide, sulfone) in surface soil ranged from 0.3 to 3.5 months; mean 1.3 mo (40 da) & 90% upper confidence bound on mean 1.5 mo (45 da). In 2 studies, estimated subsurface half life of 5 mo.		

Aerobic Soil Metabolism Rates, Mineral soils					
Study	**Soil/ conditions**	**Aldicarb t1/2**	**Sulfoxide t1/2**	**Sulfone t1/2**	**Ttl carbamate residue t1/2**
00101934	Lufkin fsl, pH6, 50% of field capacity	26			110
	Lufkin fsl, pH7, 50% of field capacity	22			75
	Lufkin fsl, pH8, 50% of field capacity	24			83
	Lufkin fsl, pH6, 100% of field capacity	9			12

	Lufkin fsl, pH7, 100% of field capacity	12			14
	Lufkin fsl, pH8, 100% of field capacity	10			15
	Houston clay, pH6, 50% of field capacity	11			13
	Houston clay, pH7, 50% of field capacity	7			12
	Houston clay, pH8, 50% of field capacity	8			11
	Houston clay, pH6, 100% of field capacity	9			18
	Houston clay, pH7, 100% of field capacity	12			16

	Houston clay, pH8, 100% of field capacity	12			31
00053370	Lakeland fsl, pH6.7			3	
00093642 and others	Houston clay	11			28
	Norwood sicl	12			47
	Lakeland fsl	17			136
45602904	"Plow layer", unsterilized	1			44
44005001	NJ soil, sl, pH6.1	2			could not determine
45592108			5		

45739801	IL sil, pH 7.9	6		15	
	NC ls, pH 6.4	10		91	

Average / 90% upper bound on mean aer soil metabolism t1/2					
	No soils	**Aldicarb t1/2**	**Sulfoxide t1/2**	**Sulfone t1/2**	**Ttl carbamate residue t1/2**
00101934	12	13.5 / 16			34 / 48
00093642 and others	3	13 / 17			70/133
All studies available for 2001 RED	17	12 / 14	5 (x 3 for single study)	3 (x 3 for single study)	42 / 55
Including post-2001 RED	19	12 / 14	5 (x 3 for single study)	36 / 88 (3 studies)	42 / 55